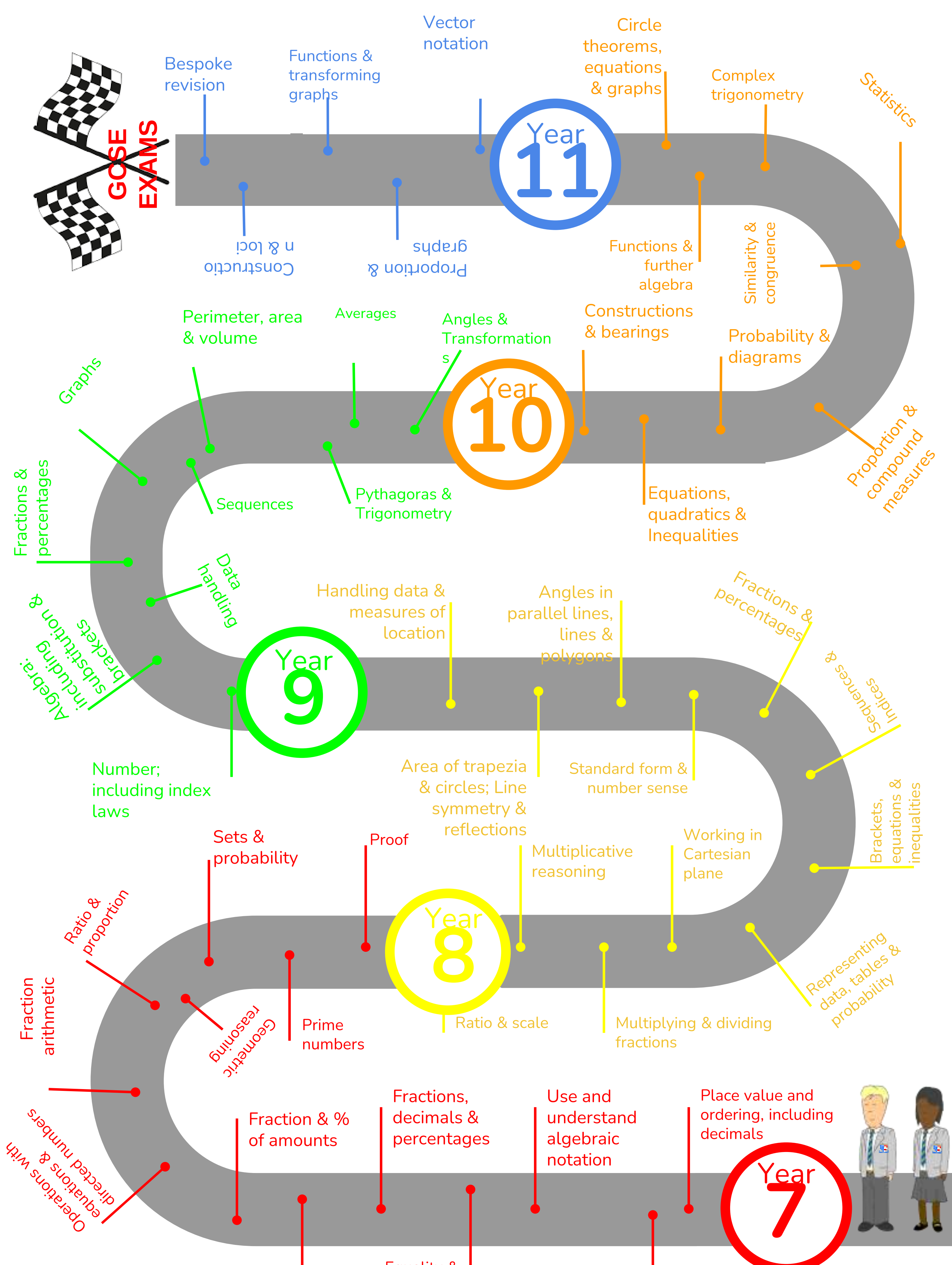
Caritas Christi Urget Nos

Year 10 Higher Scheme of Learning

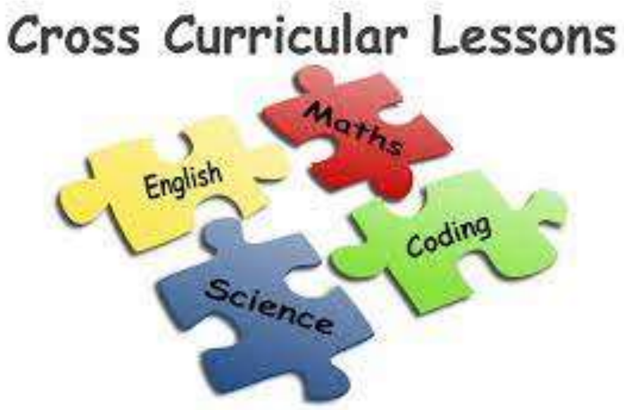
MODULE 2

Bishop Chadwick
Catholic Education Trust



Extend/Higher 2021/22
(includes Y11 bounce back)

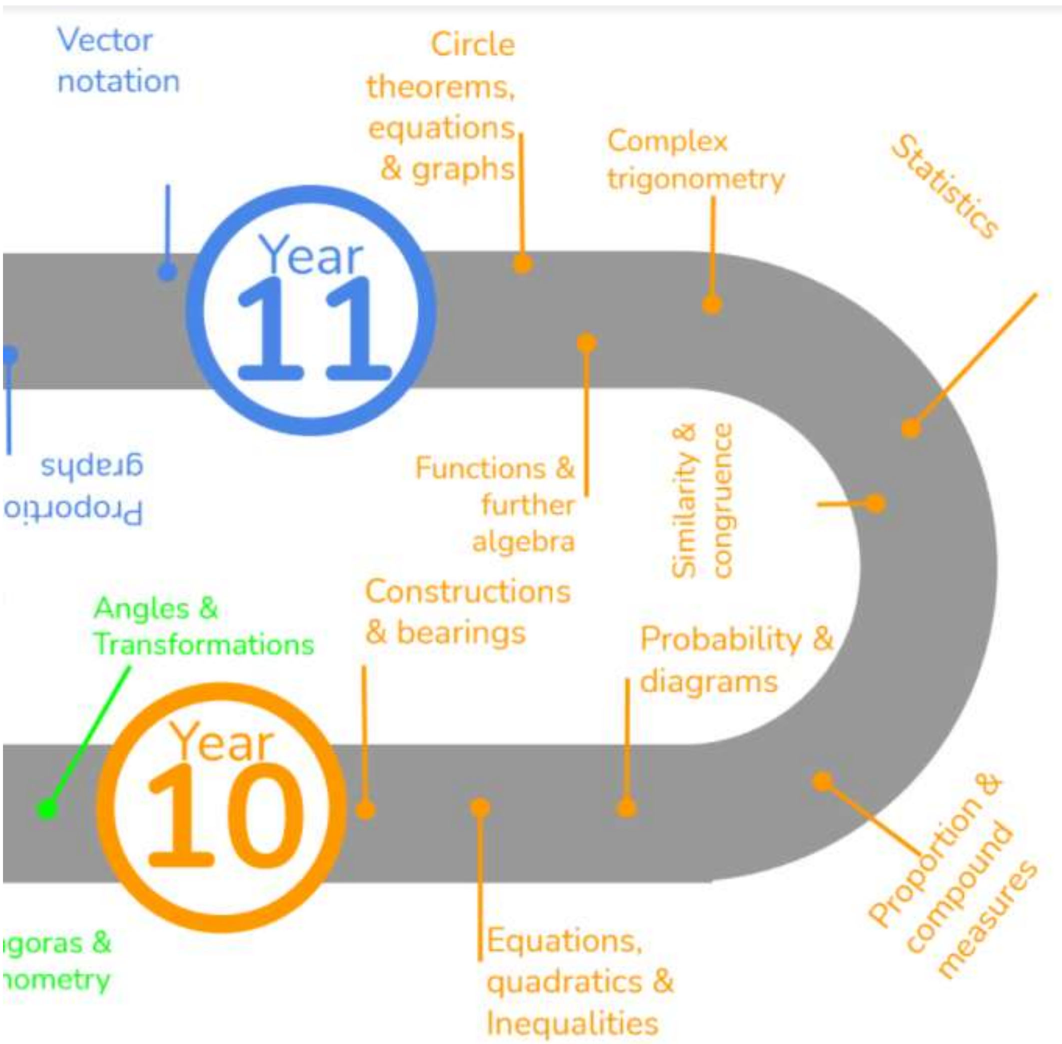
This is what your child will be taught as part of the GCSE higher course in Year 10 in their MATHS lessons.



They will have also have specific lessons linked to other subjects and a diet of retrieval built into their lessons.

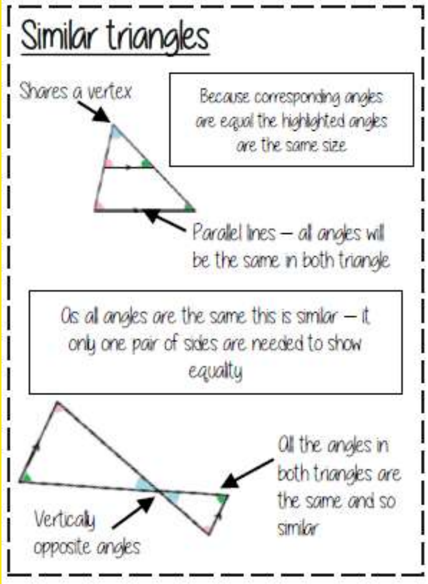
In Year 10 Module 2 your child will study the following topics:

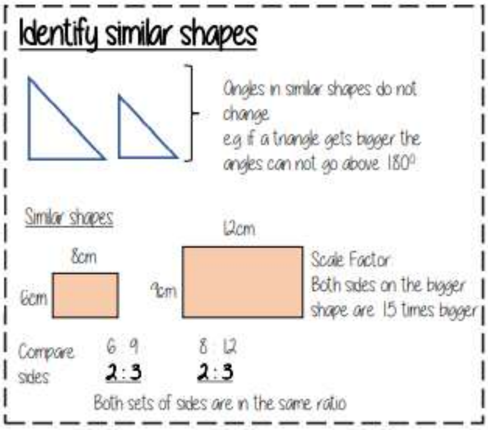
- Similarity and congruence
- Accuracy
- Further statistics
- Further trigonometry

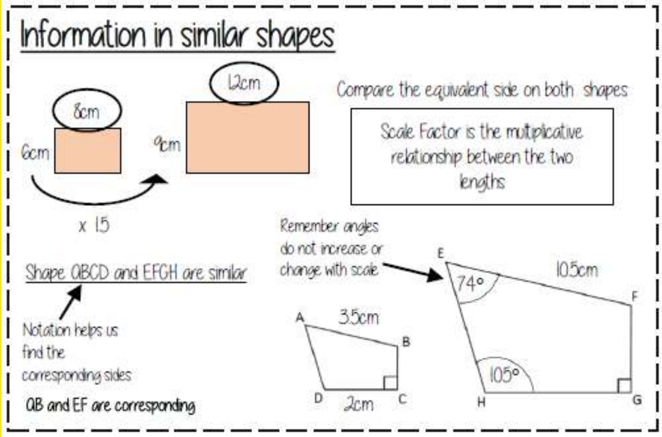


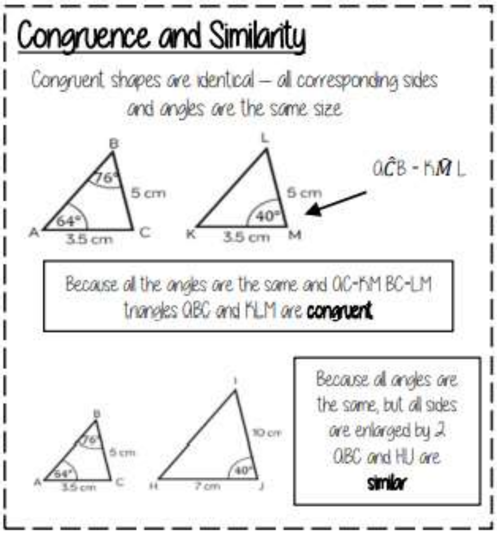
Similarity and Congruence

In this Unit students will learn
- How to prove congruency
- To use scale factors to solve problems involving length, area and volume









Conditions for congruent triangles

Triangles are congruent if they satisfy any of the following conditions

Side-side-side

All three sides on the triangle are the same size

Angle-side-angle

Two angles and the side connecting them are equal in two triangles

Side-angle-side

Two sides and the angle in-between them are equal in two triangles (It will also mean the third side is the same size on both shapes)

Right angle-hypotenuse-side

The triangles both have a right angle, the hypotenuse and one side are the same

Keywords

Enlarge: to make a shape bigger (or smaller) by a given multiplier (scale factor)
Scale Factor: the multiplier of enlargement
Centre of enlargement: the point the shape is enlarged from
Similar: when one shape can become another with a reflection, rotation, enlargement or translation
Congruent: the same size and shape
Corresponding: items that appear in the same place in two similar situations
Parallel: straight lines that never meet (equal gradients)

Accuracy

In this unit your child will study:

- Upper and lower bounds
- Calculating with bounds

Round to powers of 10 and 1 sig figure

R If the number is halfway between we "**round up**"

5495 to the nearest 1000

5000 6000

5475 to the nearest 100

5400 5500

5475 to the nearest 10

5470 5480

370 to 1 significant figure is 400
37 to 1 significant figure is 40
3.7 to 1 significant figure is 4
0.37 to 1 significant figure is 0.4
0.00037 to 1 significant figure is 0.0004

Round to the first non-zero number

Round to decimal places

2.46192 ← Focus on the numbers **after** the decimal point

"To 1dp" – to one number after the decimal
"To 2dp" – to two numbers after the decimal

2.46192 (to 1dp) - Is this closer to 2.4 or 2.5

2.4 2.5

2.4|6192 This shows the number is closer to 2.5

2.46192 (to 2dp) - Is this closer to 2.46 or 2.47

2.46 2.47

2.46|192 This shows the number is closer to 2.46

How to find the Upper and Lower Bounds?

1. Half the degree of accuracy specified
2. Add to get the upper bound.
3. Subtract to get lower bound.

Examples:

Find the lower and upper bound of 450 to the nearest 10.

1. Half the degree of accuracy = 10 ÷ 2 = 5.
2. Upper bound = 450 + 5 = 455.
3. Lower bound = 450 – 5 = 445.

Find the lower and upper bound of 5.7 to 1 decimal place.

1. Half the degree of accuracy = 0.1 ÷ 2 = 0.05.
2. Upper bound = 5.7 + 0.05 = 5.75.
3. Lower bound = 5.7 – 0.05 = 5.65.

Limits of accuracy

A width w has been rounded to 6.4cm correct to 1dp.

< 6.35 the values would round to 6.3

Error interval

≥ 6.45 the values would round to 6.5

The error interval

$6.35 \leq w < 6.45$

Any value within these limits would round to 6.4 to 1dp

A width w has been truncated to 6.4cm correct to 1dp.

< 6.4 the values would truncate to 6.3

Error interval

≥ 6.5 the values would truncate to 6.5

$6.4 \leq w < 6.5$

Any value within these limits would truncate to 6.4 to 1dp

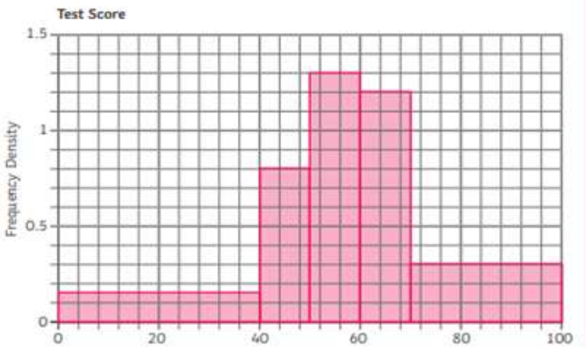
Further Statistics

In this Unit students will study:

- Quartiles
- Cumulative frequency graphs
- Box plots
- Histograms

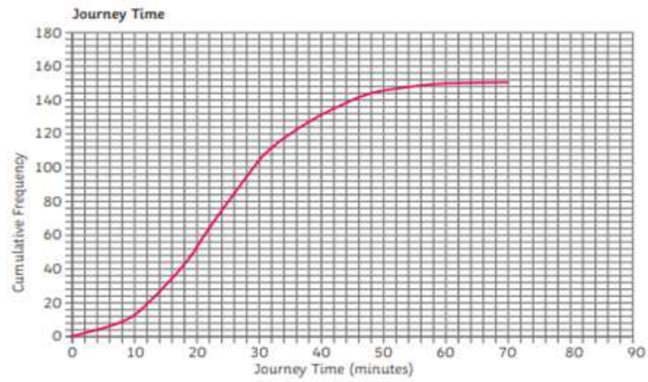
Histograms

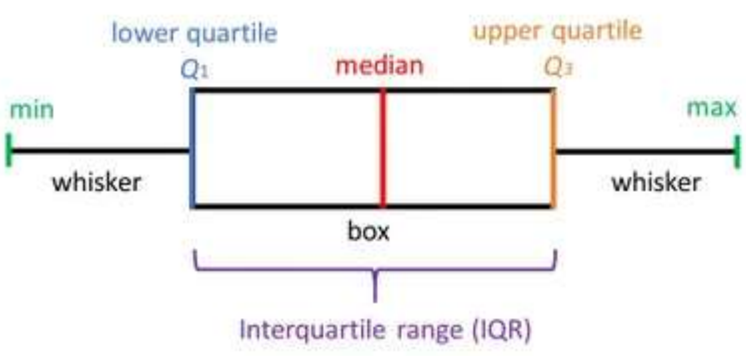
- A histogram will usually have no gaps between the bars. This is because it is used to represent continuous data.
- The area of the bars represents the frequency. So, to find the frequency we multiply the class width by the frequency density.
- The modal group is the one with the highest frequency – you can probably spot this one without a calculation. Which bar has the largest area?



Cumulative Frequency Diagrams

- A cumulative frequency diagram helps us to find other information about the data that a frequency diagram or histogram might hide.
- The highest point on the graph shows us the total frequency.
- By splitting the y-axis into quarters we can find the quartiles. These can tell us useful information about our data.





Averages from a table

Non-grouped data

Number of Siblings	0	1	2
Frequency	6	8	6
Subtotal	0	8	12

Overall Frequency: 20

Total number of siblings: 20

The data in a list: 0,0,0,0,0,0,1,1,1,1,1,1,1,1,2,2,2,2,2,2

Mean: $\frac{\text{total number of siblings}}{\text{Total frequency}} = 1$

Grouped data

x Weight(g)	Frequency	Mid Point	MP x Freq
$40 < x \leq 50$	1	45	45
$50 < x \leq 60$	3	65	195
$60 < x \leq 70$	5	65	325

Overall Frequency: 9

Overall Total: 565

Mean: 62.8g

The data in a list: 45, 55, 55, 55, 65, 65, 65, 65, 65

Further Trigonometry

In this unit your child will study:

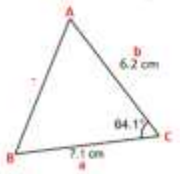
- Exact trigonometric values
- Pythagoras and Trigonometry in 3D
- The Sine Rule
- The Cosine Rule
- How to find the area of any triangle using trigonometry
- Trigonometric graphs

Area of a triangle which is not right angled

$$\text{Area} = \frac{1}{2}ab\sin C$$

You can use this formula if you know two sides and the angle between them

Find the area of the triangle



Label the triangle with the angle labelled C

$$\text{Area} = \frac{1}{2}ab\sin C$$

Area = ½ x 7.1 x 6.2 x sin(64.1)
Area = $19.8cm^2$

Trigonometric Graphs

Sine function	The sine graph repeats every 360° in both directions.	
Cosine function	The cosine graph repeats every 360° in both directions.	
Tangent function	The tangent graph repeats every 180° in both directions. The tangent graph is not defined for angles of the form (90° ± 180n°)	

You must learn the shape of each of the three graphs.

You must learn the 'period' of each graph (after how many degrees does the graph repeat)

You must learn all points where the graphs intersect both the x and y axis

Exact Trigonometric Values

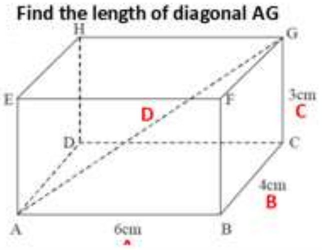
θ	0°	30°	45°	60°	90°
Sin θ	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
Cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
Tan θ	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	

Pythagoras' Theorem in 3D

$$A^2 + B^2 + C^2 = D^2$$

Where A, B and C are the length, width and height and D is always the diagonal

Find the length of diagonal AG

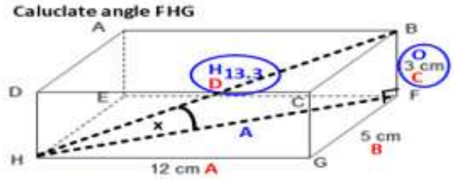


Always label the sides first

$a^2 + b^2 + c^2 = d^2$
$6^2 + 4^2 + 3^2 = d^2$
$36 + 16 + 9 = d^2$
$d^2 = 61$
$d = \sqrt{61}$
d = 7.8cm

Trigonometry in 3D

Caluclate angle FHG



To find this angle, you must use trigonometry.
You must find either BH or FH first

1 Find BH using 3D Pythagoras
Always label the sides first
$a^2 + b^2 + c^2 = d^2$
$12^2 + 5^2 + 3^2 = d^2$
$144 + 25 + 9 = d^2$
$d^2 = 178$
$d = \sqrt{178}$
d = 13.3cm

2 As you are now using trigonometry, you must label the sides O, A, H

S = O ÷ H
sin(x) = 3 ÷ 13.3
$x = \sin^{-1}(3 \div 13.3)$
x = 13°

Sine Rule – Finding a side

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

You use this rule if you know one angle and the opposite side, and one angle and you want to work out the length of its opposite side

Sine Rule – Finding an angle

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

You use this rule if you know one angle and the opposite side, and one side and you want to work out the size of its opposite angle

Cosine Rule – Finding a side

$$a^2 = b^2 + c^2 - 2bc\cos A$$

You use this rule if you know two sides and the included angle and want to work out the missing side

Cosine Rule – Finding an angle

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

You use this rule if you know all three sides and want to work out an angle

We recommend pupils have a Casio scientific calculator.
The Casio calculator featured is the one we use when demonstrating in lessons.

On our school website there is a calculation policy showing the methods we use for common operations. It can be found at: Our School > Policies